
SELF-MANAGEMENT OF RECURRENT HEADACHE

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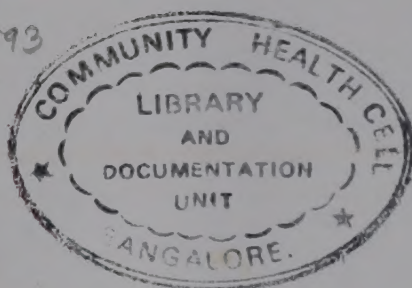
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SELF-MANAGEMENT OF RECURRENT HEADACHE

Kenneth A. Holroyd, Ph.D.
Department of Psychology and
Institute of Health and Behavioral Sciences
Ohio University
Athens, OH 45701-2979 USA

Donald B. Penzien, Ph.D.
UMC Headache Clinic
Department of Psychiatry and Human Behavior
University of Mississippi Medical Center
2500 North State Street
Jackson, MS 39216-4505 USA

Recurrent migraine and tension-type headaches

Perhaps 15% of males and 25% of females in the United States have consulted a physician about headache problems with somewhat higher consultation rates being reported in certain other industrialized countries such as Great Britain (Linnet, Stewart, Celentano, Ziegler, & Sprechter, 1989; Ziegler, Hassanein & Couch, 1977). Headache is thus one of the problems most frequently encountered by physicians in outpatient settings (DeLozier & Gagnon, 1975; Leviton, 1978). In addition to suffering periodic pain and disability, the recurrent headache sufferer in industrialized countries is at risk for the excessive use or abuse of analgesic medication. A recent US epidemiological study has found codeine containing medications to be the most frequently prescribed headache medication (Linnet et al., 1989); other research suggests that a recurrent headache disorder may be the most frequent reason for the abuse of prescription analgesic medications (Granella, Farina, Malferrari, & Manzoni, 1987).

The vast majority of recurrent headache sufferers (probably over 95%) suffer from headaches that do not result from any identifiable structural abnormality or disease state. Thus, the self-management interventions described below have the potential to benefit a significant proportion of these patients.

Classification of headaches

Currently, the most widely used classification system for headache disorders is the system published by the Ad Hoc Committee on Classification of Headache of the National Institute of Neurological Diseases and Blindness (Ad Hoc Committee, 1962). Headaches that are termed "vascular headache of the migraine type" (predominately classic and common migraine), "muscle-contraction headache" (i.e., tension

headache), and "combined headache" (vascular and muscle-contraction headache symptoms coexisting in the same headache episode) in this classification system can appropriately be treated with the nonpharmacological interventions described below. A revised classification system recently presented by the Headache Classification Committee of the International Headache Society (Olesen, 1988) appears likely to supplant the Ad Hoc Committee system when final revisions are completed in 1991 (see Table 1 for an outline of the revised system). In this revised classification system the above three categories are reduced to two higher order categories that are more precisely defined: migraine headaches and tension-type headaches. In addition, a new category, "headache associated with substances and their withdrawal" (e.g., analgesic abuse headache, ergotamine headache, narcotics abstinence headache), is of relevance here, as the interventions described below can play a role in the management of these headaches as well.

Although presenting symptom patterns vary considerably, the prototypic migraine is characterized by unilateral, pulsing pain of moderate to severe intensity (sufficient to inhibit or prohibit daily activities) and is aggravated by routine physical activity (e.g., climbing stairs). This prototypic migraine lasts 3 to 72 hours, is accompanied by nausea or heightened sensitivity to sound or light, and in a minority of sufferers is preceded by temporary focal neurological symptoms or aura (typically reversing within 60 minutes). The prototypical tension-type headache is characterized by bilateral mild to moderate intensity pain with a pressing/tightening quality (that may inhibit, but not prohibit daily activities) and is not aggravated by routine physical activity. The prototypic tension-type headache may last 30 minutes to 7 days and is not accompanied by vomiting or preceded by focal neurological symptoms.

Medical procedures used in the differential diagnosis of headaches will not be described here (see Diamond & Dalessio, 1986;

Raskin, 1988). It should be kept in mind, however, that the interventions described below are appropriate primarily for the management of recurrent migraine or tension-type (muscle-contraction) headaches. The term recurrent headaches is used here to refer to migraine or tension-type headaches that have been a continuing problem for a period of at least six months; usually they have been a longstanding problem.

Exclusion criteria

Possible Medical Complications. Patients with migraine or tension-type headaches that are of recent or sudden onset, who have experienced a recent head trauma, or exhibit changing or progressive symptoms should be medically evaluated to ensure that their headaches do not result from an underlying disease or structural abnormality. A useful list of indications for medical evaluation have been presented by Blanchard and Andrasik (1985, pp. 21-22).

Psychological Problems. Patients who are too depressed or too disabled by a major psychological disorder to cooperate in treatment, or with intellectual functioning sufficiently compromised (e.g., by organic brain syndrome) to hamper their cooperation in treatment may not be appropriate for the treatments described below.

Patients whose reading comprehension is below the eighth grade level generally will have difficulty making effective use of written materials used in the minimal-contact format. However, this is not necessarily a problem if treatment is administered by a health professional (rather than in a minimal-contact treatment format).

Medication Overuse. Excessive use of analgesic or abortive medications may aggravate or complicate headaches (c.f. Diener & Wilkinson, 1988). When this occurs, patients may need to reduce their medication use in order to benefit from either nonpharmacological or prophylactic pharmacological treatments. The possibility that medication use is complicating the patient's headache problems should be considered if any of the following conditions exist (especially when medication use greatly exceeds the levels indicated below):

1. *daily* use of aspirin or acetaminophen (1000 mg--typically 4 pills--or more/day).
2. *daily* use of sedative or analgesic medications (2 or more pills/day).
3. Use of ergotamine tartrate on three or more days/week or consumption of 10 or more mg/week.

Psychosocial interventions

In the past two decades several behavioral interventions have been widely used in the management of recurrent migraine and tension-type headaches. The most frequently used interventions fall into three categories: (a) relaxation training, (b) biofeedback training (often administered in conjunction with relaxation training), and (c) cognitive-behavior therapy (stress management). In addition, instructions to avoid dietary or other headache triggers have enabled some migraine sufferers to prevent at least some of their headaches.

Relaxation training

Three types of relaxation training have been employed: (a) progressive relaxation--alternately tensing and relaxing selected muscle groups throughout the body (Bernstein & Borkovec, 1973), (b) autogenic training--the use of self-instructions for warmth and heaviness to promote a state of deep relaxation (Schultz & Luthe, 1969), and (c) meditation or passive relaxation--the use of a silently repeated word or sound to promote mental calm and relaxation (Benson, 1975). Relaxation skills are presumed to enable the headache sufferer to exert control over headache-related physiological responses and, more generally, sympathetic arousal. Relaxation training may also provide a brief hiatus from everyday stresses and assist patients in achieving a sense of mastery or self-control over symptoms.

Biofeedback training

Biofeedback instruments enable patients to observe physiological responses that normally are unobservable. Biofeedback devices generally focus upon a particular physiological function translating it into an observable display (typically in the form of an audio tone or visual display) which is then "fed-back" to the patient. This information is used by the patient in developing the ability to self-regulate the body function being monitored.

The two types of biofeedback most frequently employed in the treatment of recurrent headaches are: (a) thermal biofeedback--feedback of skin temperature from a finger, and sometimes from a toe or foot--has most frequently been used in the treatment of migraine, and (b) electromyographic (EMG) biofeedback--feedback of electrical activity from muscles of the scalp, neck and sometimes the upper body--has most frequently been used in the treatment of tension-type headache. Both types of biofeedback training are commonly administered in combination with relaxation training. Other types of biofeedback training

(cephalic vasomotor biofeedback, electrodermal response feedback) currently are not widely used in the treatment of recurrent headaches.

Cognitive-behavior therapy/stress management

The use of cognitive-behavior therapy in headache management derives from the observation that the way individuals cope with everyday stresses and headache episodes can aggravate or maintain headaches and increase disability and distress (see Holroyd, 1986; Holroyd & Andrasik, 1982; Holroyd, Holm, & Penzien, 1988 for descriptions and reviews). Cognitive-behavior therapy focuses upon the cognitive and affective components of headache disorders (in contrast to biofeedback and relaxation interventions which focus primarily on teaching patients to self-regulate physiological responses). Cognitive-behavioral interventions are used to teach patients: (a) to identify stressful circumstances that precipitate or aggravate headaches and to employ more effective strategies for coping with these stresses, (b) to cope more effectively with pain and distress associated with headache episodes, and (c) to limit negative psychological consequences of recurrent headaches (e.g., depression and disability). One disadvantage of this treatment is that greater psychotherapeutic skill is required to administer cognitive-behavior therapy than to administer relaxation training or EMG biofeedback training.

Modifying precipitants

Some migraine sufferers can benefit by avoiding common precipitants of migraine attacks, particularly potential dietary precipitants (Blau, Path & Thavapalan, 1988; Medina & Diamond, 1978; Radnitz, 1990). For these patients, exposure to many of the common precipitants listed in Table 2 can often be managed without unduly disrupting the patient's routine.

Minimal-contact treatment format

In a minimal-contact treatment format, self-regulation skills are introduced in the clinic, but training primarily occurs at home with the patient guided by written materials and audiotapes. Consequently, only 3 to 4 (monthly) clinic sessions may be necessary when relaxation training or combined relaxation/thermal biofeedback training is delivered in a minimal-contact treatment format, while 10 or more (often weekly) clinic sessions may be required when treatment is administered entirely by a health professional. To the degree that the self-

regulation skills acquired during relaxation training or biofeedback training can be learned without professional assistance or with only minimal professional assistance, these treatments can be made more widely available and less costly. Skills acquired primarily in the patients home also might be more readily applied in the natural environment than skills acquired in a clinic setting.

Initial results obtained with minimal - contact treatment formats have been promising, suggesting that for most patients, behavioral treatments can be as effective when they are delivered in a minimal-contact format as when they are delivered by health professionals in a clinic setting (see Blanchard & Andrasik, 1985; Holroyd, 1986 for reviews). Nonetheless, some patients, such as those excessively using analgesic medications, those who are clinically depressed, or those with particularly refractory headache problems, may require more intensive clinic-based treatment. Other patients may not persist in learning or applying self-regulation skills without regular contact with a health care professional.

Efficacy of nonpharmacological treatments

A large number of mostly small-scale studies have evaluated the most frequently used nonpharmacological treatments for recurrent migraine or tension-type headache. Recent reviews of this literature include Andrasik and Blanchard (1987), Blanchard and Andrasik (1985, 1987), Holroyd (1986) and Holroyd and Penzien (1986, 1990).

Tension-type headache

Relaxation/ biofeedback treatments. Relaxation training and EMG biofeedback training generally have been found to yield similar reductions in tension headache activity in unselected samples of patients. For example, results from a meta-analysis which summarized findings from 37 studies (66 treatment and control groups) that have evaluated relaxation or EMG biofeedback treatments are presented in Table 3 (Holroyd & Penzien, 1986). It can be seen that, when results are averaged across studies, relaxation training, EMG biofeedback training and their combination each have yielded nearly a 50% reduction in tension headache activity. Each treatment yielded significantly greater reductions in headache than have been observed in untreated patients or patients treated with noncontingent biofeedback (i.e., false feedback, the most commonly used pseudotherapy control procedure), but the three

treatments do not appear to have differed in effectiveness. Findings from existing studies thus provide support for the usefulness of relaxation and EMG biofeedback treatments in the management of recurrent tension-type headaches, but do not allow us to identify one of these interventions as preferable.

It should be noted that the equivalence of outcomes noted above does not necessarily imply that these three treatments are interchangeable. Some patients who fail to respond to relaxation training, nonetheless, may benefit from subsequent EMG biofeedback training (Blanchard et al., 1982). The patients who benefit from each treatment may also differ in ways that have yet to be identified (Andrasik & Blanchard, 1987). At present, however, there is no empirical evidence to suggest there is an advantage to initiating treatment with one, rather than another, of these interventions.

Cognitive behavior therapy/stress management. A number of studies provide support for the usefulness of cognitive-behavior therapy in the management of recurrent tension-type headaches. Limited evidence also suggests that cognitive-behavior therapy adds significantly to the effectiveness of relaxation training (see reviews by Andrasik & Blanchard, 1987; Holroyd, 1986). Cognitive-behavior therapy probably adds to the effectiveness of relaxation or biofeedback treatments only for certain subgroups of headache sufferers (cf. Tobin et al., 1988). Patients most likely to benefit from cognitive-behavior therapy may be those for whom psychological problems (e.g., chronic daily stress, depression, other adjustment problems) either aggravate headaches or interfere with the application of skills acquired during relaxation or biofeedback training.

Maintenance of improvement. The limited available evidence suggests that reductions in tension headache activity achieved with the above behavioral interventions are relatively well maintained. However, follow-up data for periods of longer than a year is limited (see Blanchard, 1987, for a review).

Conclusion. The evidence reviewed above led us to choose relaxation training for the tension-type headache treatment module presented here. The effectiveness of relaxation training appears to equal, or to approach the effectiveness of other behavioral interventions. Relaxation training also does not require the equipment that is required for EMG biofeedback training. In addition, it is easier to train people to administer it than either EMG biofeedback training or cognitive-behavior therapy. Finally, a relaxation training module can readily be developed that will permit health

professionals either to administer the treatment themselves, or to make use of a minimal-contact treatment format.

Migraine

Relaxation/biofeedback treatments. There is some evidence to suggest that combined relaxation training and thermal biofeedback training is the preferred behavioral treatment for recurrent migraine. Partial results from a recent meta-analysis that summarized results from 72 studies evaluating these treatments (126 treatment and control groups) is presented in Table 3 (Penzien, Holroyd, Holm, & Hursey, 1985). When results were averaged across studies, all three behavioral interventions yielded larger reductions in migraine activity than have been observed in untreated migraine sufferers. However, combined relaxation/thermal biofeedback training yielded significantly larger reductions in migraine activity than either relaxation training or thermal biofeedback training alone. The few studies that have directly compared the effectiveness of these three behavioral treatments have yielded somewhat ambiguous results (e.g., Blanchard et al., 1982; Sargent, Solbach, Coyne, Spohn, & Segerson, 1986). However, we believe the extensive body of literature summarized by this meta-analysis justifies the use of combined relaxation/thermal biofeedback training, at least for patients who do not benefit from relaxation training alone.

Cognitive-behavior therapy. At this point no evidence is available to indicate that cognitive-behavior therapy adds significantly to the effectiveness of simpler relaxation or thermal biofeedback training procedures in the treatment of migraine (e.g., Blanchard et al., 1990).

Maintenance of improvement. The limited follow-up data suggests that improvements achieved with behavioral interventions are well maintained for 12 months, but raises the possibility that there may be some gradual loss of gains over longer periods (Blanchard, 1987).

Conclusion. The evidence reviewed above has led us to choose relaxation training with optional thermal biofeedback training (which can be conducted with a "low tech" alcohol thermometer) for the migraine treatment module. This module also allows the health professional the option of administering the treatment or of employing a primarily self-administered treatment format.

Relative effectiveness of pharmacological and behavioral interventions

Currently, little information is available concerning the relative effectiveness of nonpharmacological and pharmacological treatments or the characteristics of patients most likely to benefit from each treatment modality. The limited available evidence suggests that the primary nonpharmacological interventions produce outcomes roughly equivalent to those obtained with the most widely used prophylactic pharmacological agents when these treatments are evaluated in unselected patient samples (see Table 4; see also Holroyd & Penzien, 1990; Holroyd, Nash, Pingel, Cordingley, & Jerome, 1991; Penzien, Johnson, Carpenter, & Holroyd, 1990).

Description of treatment modules

Relaxation training

Treatment format. Relaxation training can be administered in at least three treatment formats. The trainer can teach all, or almost all of the relaxation skills to patients either individually or in a group format. In addition, a minimal-contact treatment format can be used that reduces the number of training sessions by using instructional materials and audiotapes to guide patient learning at home.

Progressive relaxation training typically requires 6 to 12 sessions, with sessions scheduled over periods that range from 6 weeks to 3 months. Most practitioners schedule weekly sessions; some prefer twice weekly sessions during the first 2 to 3 weeks, with weekly sessions thereafter. Our standard regimen requires 8 weekly sessions in the clinic, but the treatment programme may be extended as needed. Clinic sessions generally are 50 minutes in duration.

When group administered, patients may profit from the sharing of experiences and from support and assistance from other patients. However, group relaxation training requires more skill to administer successfully than individual relaxation therapy, and attrition from group treatment tends to be greater than from individual treatment. In addition, group relaxation training sessions are typically longer than individual sessions (i.e., 1.5 hours or more).

A minimal therapist-contact treatment format can reduce the number of training sessions required (see section II above, "Minimal-Contact Treatment Format"). In the minimal-contact protocol, relaxation skills are introduced in the clinic, but the greater part of skills acquisition occurs at home guided by instructional manuals and audiotapes. The most widely used minimal therapist-contact programme requires 3 clinic training sessions and two brief telephone contacts (about 15 minutes in length). Patients often prefer the minimal therapist-contact format because it is less costly and requires few office visits. We initially offer most headache patients a minimal therapist-contact treatment protocol. If a patient then has difficulty mastering relaxation skills using this training procedure, the minimal-contact protocol can be supplemented with additional clinic training sessions. However, the majority of patients with uncomplicated headache problems appear to benefit from this relaxation training protocol.

Rationale for relaxation training. A clear rationale for progressive relaxation training should be presented to the patient, and the training procedures should be outlined carefully¹. It is critical that the patient understand the nature of the treatment and be willing and able to make a commitment to participate in this self-management programme. The following is an example rationale for relaxation training that can be offered to the patient:

"This program will help you learn when your body is tense and how to get rid of the tension. Often we are not aware that we are tense. Researchers have used electronic measuring devices to measure body tension levels. We have found that often when people say that they are relaxed, their body actually shows a great deal of tension. Since body tension can produce headaches, it is important for you to learn how to: (a) prevent your body from getting tense, (b) be aware when you are becoming tense, and (c) truly relax your body."

"Relaxation skills will help you learn to control physical arousal and thus prevent headaches. Research has shown that learning to relax leads to fewer and less intense headaches for most migraine and tension headache sufferers who regularly use their skills. By relaxation training we mean a very specific set of procedures—not just

¹ This approach to progressive relaxation training for headache patients is a variation of the techniques specified by Bernstein and Borkovec (1973). Readers are encouraged to refer to that source for additional information about progressive relaxation training.

'trying to relax on your own.' Relaxation techniques will give you increased control over biological changes that can cause headaches."

It is worthwhile informing the patient that achieving a state of deep relaxation will be a positive experience. In addition to preventing or easing headache pain, relaxation has many positive effects. Many people report feeling less anxious, having more control over their emotions, having less trouble falling asleep, and other benefits after relaxation training. Unlike pharmacological interventions, there are no negative side effects with relaxation training.

It also may be worthwhile to review for the patient the differences between relaxation training and drug therapy. In a self-management treatment programme, patients will work toward adding new skills to their repertoire that they can employ actively in combating their headache problem instead of relying upon the more typical passive headache treatment strategies (i.e., taking medications and lying down). In addition, the new self-management skills emphasize prevention of headache (as opposed, for example, to using analgesic medications to relieve pain after it starts). Although relaxation training requires more work from the patient, it is accompanied by less risk of side effects and offers greater personal control over the pain cycle.

Most headache patients are successful in reducing the frequency and intensity of their headaches using these procedures (Rains, Penzien, & Holroyd, 1991). For most patients this does not mean that their headache problem will disappear, but headache reduction usually occurs. Success is probably dependent upon the effort put forth by patients as well as the practice of new skills during skill development.

Progressive relaxation training

Overview of Progressive Relaxation Training Techniques. Progressive relaxation training involves sequentially tensing and then relaxing the major muscle groups throughout the entire body, while attending to the feelings associated with both tension and relaxation. Patients learn to recognize sensations of muscular tension (as contrasted with relaxation) and to intentionally release tension in specific muscle groups. The tension-release cycles provide patients with an opportunity to become clearly aware of the feelings associated with contrasting states of muscular tension and muscular relaxation. With practice, patients can learn to become relaxed very quickly in almost any situation.

At the beginning of progressive relaxation training, the therapist defines a large number (typically 16) of specific muscle groups

and teaches the patient how to perform the various tension-release cycles. Over time, the number of muscle groups employed is gradually reduced (for example, the programme described below employs 16, 7, and 5 muscle group exercises) so that fewer tension-release cycles are required for the patient to become relaxed.

Relaxation is a learned skill, and like learning any new skill, regular practice is required to become if the patient is to become proficient in using relaxation to prevent headaches. As patients' relaxation skills improve, they generally become increasingly aware of their level of arousal which, in turn, allows them to employ relaxation skills to reduce tension levels before a headache sets in.

Progressive relaxation training works best if it is used to prevent having headaches; it is less effective when applied for terminating a headache that is underway. Therefore, we suggest that patients use their relaxation skills as soon as they notice tension building or a headache starting. In addition, regular relaxation practice may be required in order to maintain the benefits achieved with the programme.

Initially, we encourage patients to practice relaxing every day for about 30 minutes, twice per day. Some patients become very relaxed after only one or two practice sessions, and they notice almost immediate changes in their headache patterns. Other patients do not show significant headache improvement until they are more advanced in the relaxation training programme, and patients sometimes report little benefit from this treatment during the first month of skills training. The maximum benefit typically is not achieved until 2 to 3 months after the initiation of therapy.

When initiating training, ask the patient to avoid moving unnecessarily during the relaxation exercise. In addition, after a tension-release cycle is completed for a group of muscles, the patient should avoid moving or tensing that group of muscles again until the end of the exercise. However, the patient should be encouraged to make adjustments in position or posture to help maintain comfort. Patients also are asked not to speak unnecessarily. Before beginning a relaxation training session, patients should remove eyeglasses, contact lenses, tight shoes, tight watches, or tight rings.

The therapist should instruct the patient to begin tensing a muscle groups only after the therapist has given a signal. A typical signal or cue to tense a muscle group often is the word "now." For example, the therapist might say, "OK, please begin clenching your fist now." It is important that the patient release the tension in these muscles immediately upon receiving the cue to relax. A typical cue to relax is, "OK, relax

now." Instruct the patient to release the muscle tension immediately and as completely as possible (rather than allowing the tension to dissipate gradually).

In the first relaxation training session, physically demonstrate each of the tensing and release of each muscle group. Ask the patient to follow along with you, correcting errors as you proceed. Each muscle group generally should be contracted to a no more than 75% of a maximal contraction. The patient should be instructed to reduce the tension (or even release the tension immediately) if tensing the muscle produces any discomfort or muscular cramping.

Before beginning the exercise, answer any questions the patient may have. Then instruct the patient to position herself comfortably in her chair (preferably with head, neck, and arms supported and with arms and legs uncrossed) and dim the lights (if possible). Then instruct the patient to close her eyes and take several deep breaths.

Progressive relaxation training procedures.

1. Although many therapists prefer to administer the relaxation exercise live, tape recorded relaxation instructions are effective. Patients can be provided with an audiotape of individualized relaxation instructions or of standard relaxation exercises to assist them with their relaxation training at home. Transcripts of a standard progressive relaxation training procedure is presented in Appendix 1.
2. Obtain a SUDs rating ("subjective unit of discomfort") where 1 is "extremely tense" and 10 is "extremely relaxed." (see section below entitled, "Assessing the State of Relaxation").
3. Direct the patient's attention to the appropriate muscle group.
4. The patient should tense the muscle group upon receiving a cue from the therapist (i.e., "tense the muscle now").
5. After a period of 5 to 7 sec, the therapist provides the cue to release the muscle tension (i.e., "OK, relax now"), and the patient should immediately and completely releases the muscle tension.
6. The patient is directed to maintain her attention upon the muscle group as it relaxes. Ask the patient to attend to the contrasting sensations associated with tension and relaxation.
7. Two tension-release cycles can be performed for each muscle group. If the tension-release cycles are repeated, the therapist should wait 30 to 40 seconds between cycles for a given muscle group.
8. During the interim between cycles, the therapist should make statements intended to focus the patient's attention upon the relevant muscle group (e.g., "Let all of the tension go. Notice the difference between tension and relaxation. Focus on the feelings of relaxation. Notice the specific sensations associated with tension and relaxation").
9. The therapist should allow 45 to 60 seconds between the tensing of different muscle groups.
10. Throughout the session, the therapist should gradually lower his or her voice volume, tone, and rate of speech. The therapist's voice volume and rate of speech should increase somewhat during muscle tensing and be lowered during muscle relaxing.
11. After the tension-relaxation cycles are completed, instruct the patient to scan each of the muscle groups for tension. Instruct the patient to attempt to become more relaxed in areas where tension is sensed. Repeat a tension-release cycle as needed.
12. The therapist should be alert to a variety of problems patients can encounter during relaxation training and provide corrective feedback to the patient either during or after the session. Problems commonly encountered include: (1) tensing extraneous muscles along with the targeted muscle group, (2) tensing/relaxing muscles slowly, (3) gripping the chair, (4) crossing hands and legs, (5) keeping mouth tightly shut, (6) opening eyes, (7) being distracted from the task, (8) intrusive thoughts, (9) tensing too hard, and (10) excessive movement.
13. After the patient is as relaxed as possible, instruct her to remain in a relaxed position for several minutes. During this time, it can be helpful to instruct the patient to focus upon breathing or employ relaxing imagery.
14. The session can be terminated by informing the patient that you will count backward from 4 to 1. The patient is instructed she can begin to move her legs and feet on the count of 4, her arms and hands on the count of 3, her head and neck on the count of 2, and to open her eyes feeling calm and refreshed on the count of 1.

15. Ask for a post-relaxation SUDs rating.

16. Question the patient about her experience. Inquire about any problems that were encountered (e.g., muscles that were difficult to relax) and about positive experiences. Patients typically report some improvement in their state of relaxation but less frequently report becoming deeply relaxed after their first training session. They should be advised that a deep state of relaxation can be achieved with practice.

17. It can be helpful to suggest that the patient employ relaxing imagery between tension-release cycles to help to focus their attention upon relaxation.

Tension-release cycles for 16 muscle groups.
The tension-release cycles in the order in which they are conducted are listed below. (The 16 muscle group relaxation exercises are recorded on Tape #1).

1. Right lower arm and hand: By making a tight fist with your right hand, tense the right hand and lower arm. Then relax the muscles you have tensed.
2. Right upper arm: By pushing your right elbow down and back against the chair, tense your right upper arm. Then relax these muscles.
3. Left lower arm and hand: By making a tight fist with your left hand, tense the left hand and lower arm. Then relax these muscles.
4. Left upper arm: By pushing your left elbow down and back against the chair, tense your left upper arm. Then relax these muscles.
5. Forehead: By lifting your eyebrows as high as possible, tense the muscles in your forehead. Relax.
6. Cheeks and upper face: By squinting your eyes and wrinkling up your nose, tense the muscles in your upper cheeks and jaws. Then relax these muscles.
7. Lower face and jaws: By clenching your teeth and pulling the corners of your mouth backward in an exaggerated grin, tense the muscles in your lower face and jaw. Then relax.
8. Neck: By pulling your chin toward your chest while keeping it from touching your chest, tense the muscles in your neck. Then relax.

9. Chest, shoulders, and upper back: By pulling your shoulder blades together, tense the muscles in your chest, shoulders, and upper back. Then relax these muscles.

10. Stomach: By taking in a deep breath and holding it, while making your stomach hard, tense your stomach muscles. Then breath out and relax these muscles.

11. Right upper leg: By lifting your right leg slightly off the chair, tense the muscles of your right upper leg. Then relax.

12. Right calf: By extending your right leg and pulling your toes toward your head, tense the muscles in your right calf. Then relax these muscles.

13. Right foot: By straightening your right leg, turning your foot down and inward, and curling your toes, tense your right foot. Then relax.

14. Left upper leg: By lifting your left leg slightly off the chair, tense the muscles of your left upper leg. Then relax these muscles.

15. Left calf: By extending your left leg and pulling your toes toward your head, tense the muscles in your left calf. Then relax.

16. Left foot: By straightening your left leg, turning your foot down and inward, and curling your toes, tense your left foot. Then relax.

Tension-release cycles for 7 muscle groups.
During the second week of relaxation training, patients are instructed to begin to reduce the number of muscle groups used when relaxing. One goal is to help them learn to relax in a short period of time. Another goal is to help them learn to use relaxation skills in many different situations. Reducing the number of muscle groups used when relaxing helps make this possible. With practice, patients are able to relax as deeply with the reduced number of muscle groups as with all of the muscle groups. The tension-release cycles in the order they are conducted are listed below. (The 7 muscle group relaxation exercises are recorded on Tape #2).

1. Right arm: You will tense the muscles of your right hand, forearm, and upper arm all at once by pushing your right elbow down and back against the chair and making a tight fist.

2. Left arm: You will tense the muscles of your left hand, forearm, and upper arm all at once by pushing your left elbow down and back against the chair and making a tight fist.
3. Face: You will tense the muscles in your forehead, upper cheeks, lower face, and jaw all at once by lifting your eyebrows as high as possible, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth backward in an exaggerated grin.
4. Neck: (Remains the same). You will tense the muscles in your neck by pulling your chin toward your chest while keeping it from touching your chest.
5. Chest, shoulders, upper back, and stomach: You will tense these muscles all at once by taking in a deep breath and holding it, pulling your shoulder blades back and together, and by making your stomach hard.
6. Right upper leg, calf, and foot: You will tense the muscles of your right upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward.
7. Left upper leg, calf, and foot: You will tense the muscles of your left upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward.
4. Right leg: Tense your right upper leg, calf, and foot by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward.
5. Left leg: Tense your left upper leg, calf, and foot by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward.

Overcoming obstacles to successful relaxation training. Table 5 includes a list of obstacles often encountered in teaching relaxation skills to headache patients. The problems are divided into three different areas: (a) patients' attitudes and beliefs regarding treatment, (b) environmental events and experiences that interfere with skill learning, and (c) problems in maintenance or generalization from the clinic to the home environment. Table 5 also presents several techniques or strategies that are useful for addressing these problems.

Progressive relaxation training at home. Relaxation training homework should be assigned and its importance emphasized. We instruct patients to be certain to practice relaxing at least once per day, and that practicing twice per day is preferable. We suggest that our patients practice once in the morning and once in the early evening, at least 20 to 30 minutes each time. We advise patients that if they fail to practice regularly, they are less likely to achieve the best results possible with relaxation training. A tape of the relaxation training steps is provided to facilitate home practice.

We also advise patients to consider the following when practicing relaxation at home:

1. Choose a time when there will be no interruptions for at least 30 minutes.
2. Select a comfortable chair to practice in that supports the head and arms.
3. Select a place with few distracting lights or sounds to interrupt practice.

Patients are asked to anticipate any obstacles or distractions they might encounter that could interfere with their regular relaxation practice at home, and the therapist assists the patient in proposing solutions to each of the problems.

Assessing relaxation practice. Relaxation practice logs are provided for patients to keep track of their relaxation practice. Patients are instructed to fill out a relaxation log during each relaxation practice session. The relaxation log provides a place for patients to record up to

Tension-release cycles for 5 muscle groups. During the third week relaxation training, patients are instructed to further reduce the number of muscle groups used to relax to only five muscle groups. The tension-release cycles in the order in which they are conducted are listed below. (The 5 muscle group relaxation exercises are recorded on Tape #3).

1. Both arms together: Tense your right and left hands, lower arms, and upper arms all at once.
2. Face and neck: Tense all three muscle groups of your face and the muscles of your neck all at once.
3. Chest, shoulders, back, and stomach: Take in a deep breath, pull your shoulders blades back and together, and make your stomach hard all at once. Let your breath out slowly as you relax these muscles.

three relaxation practices per day. Patients are asked to monitor: (a) their relaxation rating before and after practicing relaxation, (b) the total time relaxation was practiced, and (c) any comments about the relaxation practice.

Additional relaxation techniques

Relaxation by recall. "Relaxation by recall" involves engaging in progressive relaxation exercises without actually producing muscle tension. Relaxation by recall is introduced when patients have become proficient with progressive relaxation training and have advanced to the five muscle group exercise. The procedure involves two steps: (1) carefully focusing on a muscle group to identify tension, and then (2) releasing the tension in that muscle group. Patients are to recall the feelings of releasing muscle tension they experienced when they engaged in the tensing and release of muscle groups as they attempt to release muscular tension during relaxation by recall exercises.

Relaxation by recall is initiated using the muscle groups specified in the five muscle group progressive relaxation exercise. Patients are instructed to release tension they identify in the first muscle group. When the first group is deemed relaxed, then the same is accomplished for the remaining muscle groups until all five are relaxed. If a particular muscle group is not completely relaxed after the first sequence, patients are asked to repeat the relaxation by recall exercise for that muscle group. If a relaxed state is not achieved after the second attempt, then patients are instructed to perform the actual tensing and releasing cycle for that muscle group.

With practice, most patients, can learn to quickly relax these muscles using the relaxation by recall technique. Since muscular tensing is not required, relaxation by recall is less obtrusive than the tensing and releasing of muscle groups so relaxation by recall can be employed readily in the patient's natural environment (e.g., at work, when driving). A transcript of a relaxation by recall training exercise is presented in Appendix 2. Patients can be provided with an audiotape of the relaxation by recall instructions to assist them in practicing at home. Patients are encouraged to practice the relaxation by recall at least once per day (preferably twice).

Cue-controlled relaxation. A second technique that increases the portability of relaxation exercises is referred to as "cue-controlled relaxation." When learning cue-controlled relaxation, patients begin by pairing the cue phrase "I am relaxed" with relaxed breathing exercises. After practicing this technique, the cue

phrase and relaxed breathing serve as "cues" or prompts for producing a relaxed state. The following instructions detail the steps of the cue-controlled relaxation technique:

1. Begin to breathe in through your nose and breathe out through your mouth.
2. Next, gently blow most of the air out of your lungs, and then fill your lungs again. As you fill your lungs slightly push out your stomach, causing it to rise an inch or so. Try to avoid moving your chest or shoulders as you are breathing in. (While you are trying out this technique, you can place one hand on your stomach and the other on your chest. You should be able to feel the rise in your stomach with your hand and your chest should not move).
3. Breathe in and out at a slow and regular rate. Hold your breath for a count of one, and breathe out for a count of about four. While you are breathing out, your stomach should slowly go down. Focus on the breaths you are taking.
4. As you focus on your breathing, begin to silently repeat the phrase, "I am relaxed." Each time you breathe in, say to yourself "I am," and as you breathe out, silently repeat "relaxed."

Patients are given the option of practicing cue-controlled relaxation with their eyes open or closed, but they are advised that it may be easier to learn the technique initially with their eyes closed. Like relaxation by recall, cue-controlled relaxation is less obtrusive than tension-release cycles, and once a patient has mastered the technique, she can engage in cue-controlled relaxation very often and in nearly any situation. Although patients typically do not to achieve as deep a state of relaxation using the cue-controlled technique as they do with tension-release cycles or even relaxation by recall, cue-controlled relaxation generally provides patients with a means of releasing tension quickly and discretely. This may allow the patient to reduce physiological arousal following stressful experiences and to prevent tensed muscles from remaining tensed.

Assessing the state of relaxation

Most simply, the depth of relaxation achieved by the patient can be assessed by inquiring about the patient's relaxation experience. Patients can rate their relaxation on a 1 to 10 scale, where one anchor point is "extremely tense" and the other anchor point is "extremely relaxed." A relaxation rating scheme of this type often is referred to as

a "SUDs" scale--"subjective unit of discomfort scale." Unfortunately, this approach often may yield an inaccurate assessment: social demands may lead patients to be overly positive, and patients who are inexperienced at relaxation (and seldom relaxed) may be unable to accurately gauge the state of their relaxation.

A more sophisticated and systematic approach to assessing the depth of relaxation was developed by Poppen and colleagues--the Behavioral Relaxation Scale (BRS; Poppen, 1987). The BRS uses observations of the patient's behavior rather than the patient's self-report to gauge relaxation. Subjects are observed by the therapist for 5 to 10 minute periods which are divided into 1-minute intervals. During each interval, 10 separate behaviors are rated as either relaxed or unrelaxed. Breathing is monitored during the first 30 seconds of each interval, and the remaining behaviors (involving the head, eyes, mouth, throat, shoulders, body, hands, feet, and production of sounds) are monitored and recorded during the last 30 seconds (see Table 6). A score can be obtained by calculating the proportion of behaviors rated as relaxed or unrelaxed. Poppen and colleagues have presented data supporting the reliability and validity of the BRS. Whether or not a BRS score is obtained, the trained therapist can observe the behaviors listed in Table 6 to informally gauge the depth of their patient's relaxation.

Handwarming biofeedback training

Treatment format. Like relaxation training, handwarming biofeedback can be taught to individual patients or groups of patients by a health professional. Typically, 6 to 12 treatment sessions are administered over a 6 week to 3 month period, with clinic sessions generally 30 minutes to one hour in duration. Handwarming biofeedback training also can be administered in a minimal-contact treatment format that requires as few as three clinic visits. We elect to offer handwarming biofeedback only as an adjunct to relaxation training, and we prefer that a patient has developed a beginning level proficiency with relaxation prior to initiating handwarming biofeedback therapy. Other clinics successfully employ handwarming biofeedback as a sole intervention or concurrently with relaxation training.

Equipment. Options for temperature biofeedback devices include: (a) alcohol thermometers--9 cm long, designed to be attached to the finger, and commercially available from suppliers of biofeedback equipment for less than \$1 each, (b) portable electronic thermal biofeedback units--digital

devices with a thermistor, commercially available for less than \$100, and (c) office-type digital devices with a thermistor, commercially available for \$300 and up. Although the electronic devices provide higher resolution feedback, the alcohol thermometer can be used successfully and is more readily portable.

Rationale for handwarming training. A clear rationale for handwarming biofeedback training should be presented to the patient, and the training procedures should be explained carefully. Early explanations of the therapeutic mechanism of temperature biofeedback for migraine held that improvements in migraine result from patients "learning to turn off excessive sympathetic outflow" (Sargent, Walters, & Green, 1973, p. 419) because it was assumed that peripheral vasodilation during volitional handwarming resulted solely from decreased sympathetic (alpha-adrenergic) activity. However, this assumption recently has been challenged with the identification of a beta-adrenergic vasodilating mechanism (Freedman, Sabharwal, & Ianni, 1988). At present, although the exact mechanism whereby this nonpharmacological treatment produces improvement in migraine remains unclear, most maintain that handwarming biofeedback assists patients to gain increased awareness and voluntary control of autonomic function.

The following is an example rationale for relaxation training that can be offered to the patient:

"Handwarming biofeedback was first used at the Menninger Clinic, a famous medical center in Kansas. There, researchers discovered that headache patients who learned to warm their hands using biofeedback, and who used their handwarming skills regularly, had fewer and less severe headaches. Here's how it works. When a person is aroused or under stress, the blood vessels in the fingers narrow and the hands become cooler. When you become aroused and tense (often during or after stress), the blood vessels in your hands narrow, and your hands get colder. That's where the expression "cold and clammy hands" comes from. On the other hand, when you're relaxed and calm, the blood vessels in your hands dilate, and your hands get warmer. You can get an idea of how aroused you are by taking your hand (or finger) temperature with a thermometer or a temperature biofeedback instrument. You can learn to reduce your arousal through the process of temperature biofeedback training which involves using a biofeedback device to give you an idea of how tense you are. If your hands are cool, you can take steps to

reduce your arousal while using the biofeedback instrument to tell you how well you are doing."

Training techniques. The patient is instructed to place the bulb of the thermometer or the thermistor onto the center of the fingerprint of an index finger and tape it in place using porous or surgical tape (exact placement of temperature probe is not critical, but placement should be consistent across training sessions; Schwartz, 1987). She is instructed to wrap the bulb with only one layer of tape and cautioned to avoid attaching the thermometer too tightly because this may impede the blood flow into the finger. After the thermometer has been taped to the finger, the patient should sit quietly in a comfortable position for 5 to 10 minutes to allow her temperature to stabilize. The patient then is asked to try to reduce her arousal by using the biofeedback device to provide an index of her tension level. If her hands are cool, she is encouraged to take steps to reduce her arousal while using the thermometer to gauge her success.

Ambient temperature can influence the course of handwarming biofeedback training. Optimally, the ambient temperature should be 72° F, with a range of no less than 68° and no more than 75° F. Prior to biofeedback training, headache patients' hand temperatures commonly are in the middle to upper 80° F range (standard deviations approximately 8°; cf. Blanchard, Morrill, Wittrock, Scharff, & Jaccard, 1989). With training, many patients can learn to raise their hand temperature into the mid 90° range.

The following information can be helpful to patients learning the handwarming response. First, the handwarming response occurs slowly, so patients should be advised to assess their progress using their biofeedback device only periodically. Second, the handwarming response appears to occur most readily when patients adopt a passive strategy and "allow the handwarming to occur" rather than actively "forcing" the response. Furthermore, it can be helpful to adopt an "experimenter's attitude," and to be willing to try a variety of different strategies might serve to raise hand temperature; they should use the feedback from the biofeedback device to help them identify the most effective strategies. We caution patients that the handwarming response is a skill that often takes time to learn--some patients' hand temperature actually decreases when they are first learning to control their hand temperature. Finally, patients should practice for no longer than 20 minutes because autoregulatory responses limit the patients' ability to warm their hands after 15 to 20 minutes (Freedman & Ianni, 1983).

Different patients use different strategies to raise hand temperature. Patients can be invited to try several strategies to see what works best for them. Below are several examples of cognitive strategies:

1. *Imagery.* Some people find that they can warm their hands by imagining pleasant scenes or images that remind them of warmth or calm. For example:

- Some people imagine they are warming their hands over a crackling fire.

- Others imagine they are lying in the warm sand on a sunny beach.

- A few people have imagined their warm blood flowing directly to their fingertips.

2. *Repeat the Word "Warm."* Some people find that if they silently repeat the word "warm" or "warmth" over and over again while closing their eyes and breathing deeply, their temperature rises.

3. *Autogenic Phrases.* Repeating phrases like these to oneself helps some patients to become relaxed and raise their hand temperature: I feel quiet ... I am beginning to feel quite relaxed ... my hands and arms are heavy and warm ... my feet feel heavy and relaxed ... my knees and my hips feel relaxed and comfortable ... I feel quite peaceful and calm ... my whole body is becoming relaxed, and my hands are relaxed and warm ... my arms and shoulders are heavy and comfortable ... my neck, my jaw, and my forehead feel relaxed ... warmth is flowing into my hands ... my whole body is calm, heavy, comfortable, and relaxed ... my hands are very warm.

4. *Sensory focus.* Patients can concentrate on and enhance the specific sensations that are associated with increases in hand temperature. Even if the patient is not be able to find words to describe these sensations they may be able to identify sensations associated with successful production of the handwarming response and by producing or magnifying these sensations control the handwarming response.

Overcoming obstacles to successful biofeedback training. Table 7 presents a list of obstacles often encountered in training handwarming skills. The problem areas addressed are: (a) patients' attitudes and beliefs regarding treatment, (b) environmental events and experiences that interfere with skill learning,

and (c) problems in maintenance or generalization from the clinic to the home environment.

Handwarming biofeedback homework. We ask patients to practice handwarming at least once (preferably twice) each day for about 15 minutes each time. Suggestions about the setting and circumstances that are appropriate for relaxation training apply equally well for handwarming biofeedback training. It also is worthwhile to encourage patients to warm their hands immediately following other relaxation exercises.

Assessing Handwarming Biofeedback Practice. Biofeedback practice logs are provided for patients to keep track of their handwarming practice. Patients are instructed to fill out a practice log during each relaxation practice session. This log provides a place for patients to record up to three handwarming practices as well as three relaxation practices per day. For handwarming practice, patients are asked to monitor: (a) their hand temperature at the beginning and the end of each practice session, (b) their relaxation rating before and after handwarming practice, (c) the total time handwarming and relaxation was practiced, and (d) any comments about their practice that day.

Application of handwarming skills. Patients are advised that handwarming biofeedback works best if it is used in the following two ways:

1. Handwarming works well if it is employed in the early stages of a headache--when headache-related physiological arousal is increasing. Patients are encouraged to use their handwarming skills whenever they are aware that their hands are cool or at the onset of a headache.
2. Handwarming biofeedback works well if it is practiced periodically throughout the day; in this manner, patients can prevent their hands from becoming cool and thus stave off headache-related physiological arousal.

Criteria for altering or terminating treatment

Failure to respond to an adequate trial

The parameters of a minimally adequate trial of relaxation training or combined relaxation/thermal biofeedback training (that would, for example, assure that 80 or 90% of

potential responders to these treatments had the opportunity to respond) have not been precisely specified. Although most patients who will benefit from these treatments probably improve within 8 to 12 weeks of beginning treatment (this is the treatment period that typically has been used in studies that have evaluated these treatments), some findings suggest that there are patients who benefit only when they receive a greater number (over 15) of clinician administered treatment sessions (Reich, 1988). It seems reasonable, however, to provide patients with an alternate treatment if they have failed to benefit from either the tension-type or migraine treatment protocol described in the previous section. This might involve more intensive nonpharmacological treatment (clinic administered biofeedback training, or cognitive-behavior therapy) or prophylactic pharmacological treatment (e.g., amitriptyline or propranolol).

Definition of responder

Patients are often considered to have shown a clinically significant improvement if they show at least a 50% reduction in headache activity (frequency or number of hours of headache, or a combined score taking the two variables into account). The frequency and severity of headaches is probably best estimated from daily recordings made by the patient. Minor modifications in the recording format appear to have little impact on the headache frequency and severity scores obtained (Collins & Martin, 1980). However, patient retrospective reports of headache activity or improvement yield a somewhat less desirable improvement measure and may tend to overestimate improvements calculated from daily recordings (Penzien, Johnson, Seville, Rubman, & Boggess, 1990).

Patients who receive behavioral treatment also frequently show reductions in headache-related psychological symptoms or distress and general somatic complaints (assessed by psychological tests such as the Beck Depression Inventory, Beck & Steer, 1987; Trait and State Anxiety Scales, Spielberger et al., 1979; and Wahler Physical Symptoms Inventory, Wahler, 1983). Patients' perception that their headaches are within their control (as assessed by measures such as the Headache Specific Locus of Control Scale; Martin, Holroyd, & Penzien, 1990) also may be enhanced following treatment (e.g., Holroyd et al., 1990; Penzien, Johnson, Carpenter, & Holroyd, 1990). These latter benefits may be as much or more appreciated by some patients as reductions in migraine or tension-type headache activity.

Alteration or progression of symptoms

If symptoms change or become progressively more severe, or if the patient fails to benefit from several different types of treatment, the patient should be reevaluated to assure that their headaches have been correctly diagnosed.

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Table 1**Headache Classifications of the International Headache Society's Headache Classification Committee*****Migraine and Tension-Type Headache:**

1. Migraine
 - 1.1 Migraine without aura
 - 1.2 Migraine with aura
 - 1.2.1 Migraine with typical aura
 - 1.2.2 Migraine with prolonged aura
 - 1.2.3 Familial hemiplegic migraine
 - 1.2.4 Basilar migraine
 - 1.2.5 Migraine aura without headache
 - 1.2.6 Migraine with acute onset aura
 - 1.3 Ophthalmoplegic migraine
 - 1.4 Retinal migraine
 - 1.5 Childhood periodic syndromes that may be precursor to or associated with migraine
 - 1.5.1 Benign paroxysmal vertigo of childhood
 - 1.5.2 Alternating hemiplegia of childhood
 - 1.6 Complications of migraine
 - 1.6.1 Status migrainosus
 - 1.6.2 Migrainous infarction
 - 1.7 Migrainous disorder not fulfilling above criteria
2. Tension-Type Headache
 - 2.1 Episodic tension-type headache
 - 2.1.1 Episodic tension-type headache associated with disorder of pericranial muscles
 - 2.1.2 Episodic tension-type headache unassociated with disorder of pericranial muscles
 - 2.2 Chronic tension-type headache
 - 2.2.1 Chronic tension-type headache associated with disorder of pericranial muscles
 - 2.2.2 Chronic tension-type headache unassociated with disorder of pericranial muscles
 - 2.3 Headache of the tension-type not fulfilling above criteria

Additional Classifications

3. Cluster headache and chronic paroxysmal hemicrania
4. Miscellaneous headaches unassociated with structural lesion
5. Headache associated with head trauma
6. Headache associated with vascular disorders
7. Headache associated with non-vascular intracranial disorders
8. Headache associated with substances or their withdrawal
9. Headache associated with non-cephalic infection
10. Headache associated with metabolic disorder
11. Headache or facial pain associated with disorder of the cranium, neck, eyes, ears, sinuses, teeth, mouth, or other facial or cranial structures
12. Cranial neuralgias, nerve trunk pain, & deafferentiation pain

*Source: Olesen et al. (1988)

Table 2.**Precipitating Factors of Migraine as Identified by Patients***

1. Lack of Food	Fasting Insufficient food Delayed or missing meals
2. Specific Foods	Aged cheese Alcohol (especially red wines) Chinese food (monosodium glutamate) Chocolate Coffee, tea, or other caffeinated beverages Nuts
3. Sleep	Excessive sleep Insufficient sleep
4. Hormones (females only)	Menstrual periods (before, during, after) Post-menopausal Oral contraceptives or hormone supplements Pregnancy
5. Environment	Heat Cold Light Noise Odors, smoke, or fumes
6. Exercise	
7. Allergy	
8. Stress	During stress After stress (i.e., "let down headache")
9. Smoking	

* Adapted from J.N. Blau, F.R.C. Path, & M.B. (1988). Preventing migraine: A study of precipitating factors. *Headache*, 28. 481-483.

Table 3

Meta-Analysis of Nonpharmacological Treatments for Muscle-Contraction and Migraine Headache: Average Improvement from Pre- to Posttreatment by Type of Treatment and Type of Headache

Type of Treatment	Average % Improvement	Treatment Groups (n)	Improvement Range
Muscle Contraction Headache Treatment			
Combined EMG biofeedback and relaxation training	57.1 ^a	9	29 to 88
EMG biofeedback training	46.0 ^a	26	13 to 87
Relaxation training	44.6 ^a	15	17 to 94
Noncontingent biofeedback training control	15.3 ^b	6	-14 to 40
Headache monitoring control	-3.9 ^b	10	-28 to 12
Vascular Headache Treatment			
Combined relaxation training and thermal biofeedback	55.1 ^c	28	11 to 93
Relaxation training	37.5 ^d	38	5 to 81
Thermal biofeedback training	35.0 ^d	14	- 8 to 80
Headache monitoring control	3.0 ^e	15	-30 to 33
^a Source: Holroyd & Penzien (1986), and Penzien et al. (1985). ^{a,b} Numbers sharing a superscript do not differ significantly.			

Table 4

Meta-Analysis of Propranolol and Relaxation/Biofeedback Treatments for Migraine Headache: Average Improvement from Pre- to Posttreatment by Type of Treatment and Type of Headache

Type of Treatment	Average % Improvement	Treatment Groups (n)	Improvement Range
Combined relaxation training and thermal biofeedback	55.1 ^a	28	11 to 93
Propranolol	55.1 ^a	25	26 to 87
Placebo	12.2 ^b	20	-23 to 32
Headache monitoring control	1.1 ^b	17	-30 to 33

Source: Holroyd & Penzien (1990)

^{a,b} Numbers sharing a superscript do not differ significantly.

Table 5

Relaxation Training: Problems and Solutions*

Problem Area	Techniques for Maximizing Effectiveness
<i>Patient's Attitude</i>	
1. Patient has negative self-statements ■	Identify them and help patient to modify them.
2. Patient is overly concerned about her performance ■	Suggest that patient is trying too hard and suggest an attitude of passive volition.
3. Patient is hesitant to relinquish control and vigilance ■	Discuss concerns about decreasing vigilance and control
	■ Help patient reappraise relaxation as a way to gain control, not lose control.
<i>Learning the Skill</i>	
1. Patient falls asleep when practicing relaxation ■	Do not schedule relaxation practice just after meals or before bedtime.
	■ Sit up in a chair during relaxation practice.
2. Patient's concentration is disturbed by interfering thoughts and feelings ■	Develop imagery techniques (e.g. placing interrupting thoughts in an imaginary closet or trunk).
3. Patient's mind "wanders" during relaxation practice ■	Help patient focus attention by repetition of autogenic phrases (e.g. peaceful, calm).
<i>Maintenance and Generalization</i>	
1. Patient reports no carry-over effect after relaxation ■	Help patient internalize exercise and develop self-control.
	■ Introduce brief cue-controlled techniques that can be used periodically throughout the day.
2. Patient has difficulty detecting relaxation and tension differences. ■	Help patient identify subjective cues of relaxation and tension.
	■ Use relaxation and tension discrimination training.

* Adapted from K.A. Holroyd, J.E., Holm, & D.B. Penzien, (1988). Clinical issues in the behavioral treatment of recurrent headache. In P.A. Keller, & S. R. Heyman (Eds.), *Innovations in Clinical Practice: A Source Book*. Sarasota, FL: Professional Resource Exchange.

Table 6

Relaxed Behaviors from Poppen's Behavioral Relaxation Scale*

1. Head: supported by chair; nose in midline of the body; head not tilted; no motion
2. Eyes: eyelids lightly closed with smooth appearance; no motion under eyelids
3. Mouth: lips parted slightly at the center of the mouth; front teeth parted; no tongue motion
4. Throat: no motion (e.g., swallowing, other larynx action, twitches)
5. Shoulders: appear rounded, transect same horizontal plane and rest against chair; no motion
6. Body: torso, hips, and legs are symmetrical around midline and resting on the chair; no motion
7. Hands: resting on armrest or lap with palms down and fingers curled in a claw-like fashion
8. Feet: pointed away from each other at a 60 to 90° angle; feet not crossed at ankles; no motion
9. Quiet: no vocalizations or loud respiratory sounds (e.g., talking, sighing, gasping, coughing)
10. Breathing: breath frequency less than that observed during baseline; no breathing irregularities that interrupt the regular rhythm of breathing (e.g., coughing, yawning, sneezing)

* Adapted from Poppen, R. (1987). Behavioral Relaxation Training and assessment. New York: Pergamon.

Table 7

Biofeedback Training: Problems and Solutions*

Problem Area	Techniques for Maximizing Effectiveness
<i>Patient's Attitude</i>	
1. Patient does not think she is changing the biofeedback signal	<ul style="list-style-type: none"> ■ Encourage patient to adopt an experimenter's attitude. ■ Encourage patient to look at thermometer less often.
2. Patient perceives the task as an achievement challenge	<ul style="list-style-type: none"> ■ Assist patient to reappraise the situation and to adopt a more passive approach.
3. Patient is anxious regarding her performance and vigilance	<ul style="list-style-type: none"> ■ Reassure patient about her ability to learn the skill, and allow patient to practice without therapist present to minimize performance anxiety.
<i>Learning the Skill</i>	
1. There is no change in the handwarming response (autogenic phrases).	<ul style="list-style-type: none"> ■ Problem solve with patient to develop a more effective strategy (e.g. supplemental imagery, <p>If using an electronic biofeedback unit:</p> <ul style="list-style-type: none"> ■ Alter signal threshold to make task easier. ■ Use response shaping technique to initiate change.
2. Hand temperature decreases rather than increases	<ul style="list-style-type: none"> ■ Suggest that patient may be trying too hard and encourage a more passive approach. ■ Consider using shorter treatment periods (15 minutes or less) because an autoregulatory mechanism may oppose vasodilation after 15 or 20 minutes. ■ Ensure that ambient temperature is sufficiently warm.
3. Lack of variability in the patient's hand temperature makes biofeedback difficult	<ul style="list-style-type: none"> ■ Investigate potential physiological effects of patient's medications (e.g. propranolol). ■ Advise patient can be difficult to raise hand temperature above 90°F.
<i>Maintenance and Generalization</i>	
1. Patient shows extreme variability in control from one clinic training session to the next	<ul style="list-style-type: none"> ■ Emphasize home practice to help reduce between-session variability and increase self-control consistency.
2. Patient has difficulty recognizing subjective cues and relies on feedback signal for indication of success	<ul style="list-style-type: none"> ■ Help patient identify subjective cues of success, and stress importance of developing self-control skills.

* Adapted from K.A. Holroyd, J.E., Holm, & D.B. Penzien, (1988). Clinical issues in the behavioral treatment of recurrent headache. In P.A. Keller, & S. R. Heyman (Eds.), *Innovations in Clinical Practice: A Source Book*. Sarasota, FL: Professional Resource Exchange.

Appendix 1

Transcripts of Progressive Relaxation Training Audiocassettes

Excerpted from the Headache Home Treatment Manual: Therapist's Manual by Donald B. Penzien, Cheryl A. Johnson, & Kenneth A. Holroyd (1989)

Tape #1, Side #1 (referred to as Tape 1): 16 Muscle Group Progressive Relaxation Training

Tape #1, Side #2 (referred to as Tape 2): 7 Muscle Group Progressive Relaxation Training

Tape #2, Side #1 (referred to as Tape 3): 5 Muscle Group Progressive Relaxation Training

Tape #2, Side #2 (referred to as Tape 4): Relaxation by Recall

Transcripts written and edited by: Donald B. Penzien, Ph.D., Jean C. Beckham, Ph.D., and Lori A. Pert, Ph.D.

Progressive relaxation training procedures adapted from: Bernstein, D. A., & Borkovec, T. D. (1973). *Progressive Relaxation Training: A Manual for the Helping Professions*. Champaign, IL: Research Press.

Narrated by: James E. Peck, Ph.D., Assistant Professor of Surgery (Otolaryngology) University of Mississippi Medical Center

Recording and editing of tapes by: Mr. Leslie Boyd, Mr. Frank Meyers, and Mr. Jim Worley Audiovisual Department, University of Mississippi Medical Center

Tape 1

Progressive Relaxation: Sixteen Muscle Groups

Get yourself in a comfortable relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. Now, close your eyes and let yourself begin to relax (12 sec).

Ok. I'd like you to focus all of your attention on the muscles of your right hand and lower arm. All right, by making a tight fist, I'd like you to tense the muscles of your right hand and lower arm, now. Feel the muscles pull, notice what it's like to feel tension in these muscles as they pull and remain hard and tight... And relax, just letting these muscles go ... noticing how they feel now as compared to before.. Focusing on these muscles as they relax more.. and more deeplythinking about nothing but the pleasant feelings of relaxation.....(12 sec).

All right, by pushing your right elbow down and back against the chair, I'd like you to tense your right upper arm, now. Feel the muscles in your upper arm pull.....(5 sec) And relax, releasing the tension. Letting the muscles go.... feeling these muscles become more and more relaxed....noticing what these muscles feel like now as compared to when they were tense...focusing on these muscles as they unwind, smooth out, and relax more ... and more deeply.....(12 sec).

By making a tight fist, I'd like you to tense the muscles in your left hand and lower arm, now. Notice what it's like to feel the tension in these muscles as they pull and remain hard and tight.... And relax, letting all the tension go..... noticing the difference between tension and relaxation....focusing on these muscles as they relax more.. and more deeply..... focusing all your attention on the feelings of relaxation flowing into these muscles.....(12 sec).

All right, by pushing your left elbow down and back against the chair, I'd like you to tense your left upper arm, now. Feel the muscles in your upper arm pull..... And relax...letting the muscles go.... focusing on the feelings associated with relaxation flowing into these muscles... noticing what it feels like... as the muscles become more and more relaxed...There is nothing for you to do .. but focus your attention on the pleasant feelings of relaxation.....(12 sec).

By lifting your eyebrows as high as possible, I'd like you to tense the muscles in your forehead, now. Feel how tight and hard the muscles in your forehead feel.... And relax...just enjoying the sensations of pleasant, comfortable

relaxation.....noticing how these muscles feel as they smooth out, unwind, and relax more and more deeply....feeling warm, peaceful, calm and relaxed.....(12 sec).

By squinting your eyes and wrinkling up your nose, you can tense the muscles in your upper cheeks and jaws, now. Focus on what it's like to feel tension in these muscles as they are hard and tensed.... And relax...focusing your attention on the feelings associated with warm, comfortable relaxation flowing into these muscles..... just enjoying the pleasant feelings of relaxation..... as the muscles go on relaxing more and more deeply.....(12 sec).

By clenching your teeth and pulling the corners of your mouth backward in an exaggerated grin, you can tense the muscles in your lower face and jaw, now. Hold that tension, concentrate on the feeling of tightness and hardness in those muscles... And relax, release the tension. Just letting your muscles go, thinking about nothing but the pleasant feelings of relaxation.....Noticing the difference between the tension and relaxation..... focusing on the feelings in the muscles of your lower face and jaw as they become more... and more relaxed.....(12 sec).

By pulling your chin toward your chest while keeping it from touching your chest, I'd like you to tense the muscles in your neck, now. Feel the muscles pull and become hard and tense... And relax..let all the tension go..... just enjoying the sensations of deep, complete relaxation flowing into these muscles..... more and more deeply and completely relaxed..... Notice how the muscles feel when so completely relaxed... feeling calm, peaceful, and relaxed....(12 sec).

By pulling your shoulder blades together, I'd like you to tense the muscles in your chest, shoulders, and upper back, now. Feel the tension building in your chest, shoulders, and upper back as the muscles are tense and tight.... And relax...letting all the tension go..... focusing on these muscles as they loosen up, smooth out, unwind, and relax.... noticing what it feels like as the muscles become more and more relaxed.... just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply.... more and more completely..... (12 sec).

All right, by making taking in a deep breath and holding it, while making your stomach hard, you can tense your stomach

muscles, now. Hold the tension in your stomach muscles... Notice what it's like to feel tension in these muscles.... And relax... Just experiencing the sensations of deep, complete relaxation flowing into these muscles.... more and more deeply, more and more completely relaxed....thinking of nothing but the very pleasant feelings of relaxation.....(12 sec).

All right, by lifting your right leg slightly off the chair, I'd like you to tense the muscles in your right upper leg, now. Feel these muscles become hard and tense, focus on the tension in these muscles.... And relax, just letting the muscles go.... noticing the difference between tension and relaxation.... focusing on the pleasant feelings in the muscles as they become more ... and more relaxed....Feeling warm..heavy..loose..and relaxed.....(12 sec).

By extending your right leg and pulling your toes toward your head, you can tense the muscles in your right calf, now. Focus on the tightness and tension in these muscles. Feel how they pull..... And relax, release the tension....Just enjoying the feelings in these muscles as they loosen up...smooth out..unwind... and relax more.. and more deeply. There is nothing for you to do but focus your attention on the very pleasant, warm feelings of relaxation flowing into these muscles... feeling calm, pleasant, peaceful, and relaxed.....(12 sec).

By straightening your right leg, turning your foot down and inward, and curling your toes, I'd like you to tense your right foot, now. Feel the hardness and tightness as the muscles pull, focus on that tension.... And relax....letting these muscles go....thinking about nothing but the very pleasant feelings of warmth and relaxationnoticing how these muscles feel now as compared to before....feeling the relaxation flowing throughout the muscles as they relax more.. and more deeply.....(12 sec).

By lifting your left leg off the chair slightly, I'd like you to tighten the muscles of your left upper leg now. Feel the muscles pull as they remain hard and tight, focus on that tension.... And relax, letting all the tension go.... focusing your attention on the feelings associated with warm relaxation flowing into these muscles....Just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply..... more and more completely.....(12 sec).

By straightening your left leg and pulling the toes of your left foot toward your head, I'd like you to tense the muscles in your left calf, now. Hold that tension, feeling the muscles pull, noticing what it's like to feel tension in the muscles.... And relax, letting these

muscles go.....noticing how they feel now as compared to before.....There is nothing for you to do but focus your attention on the very pleasant feelings of deep relaxation.... Just noticing what it's like as the muscles become more and more deeply relaxed.....(12 sec).

By straightening your left leg, turning your left foot down and inward and curling your toes, you can tense the muscles in your left foot, now. Noticing what it's like to feel tension in these muscles as they pull and remain hard and tight.... And relax, let these muscles go....just enjoying the feelings in these muscles as they loosen up.....unwind.... relax more and more deeply. Feeling comfortably warm, loose, heavy and relaxed.....(12 sec).

Now, we've relaxed the muscles in the arms and hands....just allow them to continue relaxing (5 sec)....We've relaxed the muscles in the face and neck....go on allowing them to remain deeply relaxed (5 sec)... We've relaxed the muscles in the chest, the shoulders, the upper back, the stomach... allow these muscles now to become even more deeply relaxed (5 sec)... We've relaxed the muscles of the legs and feet... just allow these muscles to remain deeply and completely relaxed (5 sec).... If you notice any tension in any of your muscles, just focus on releasing the tension in these muscles.....Focus all your attention on the pleasant feelings associated with relaxation (10 sec). Feeling calm, peaceful, and relaxed. Noticing what it feels like as the muscles become more and more relaxed.... enjoying the feelings of deep relaxation.. as the muscles go on relaxing more and more completely (10 sec). There is nothing for you to do but to focus your attention on the very pleasant feelings of deep relaxation flowing throughout your body....Feeling warm, calm, peaceful, and relaxed (15 sec).

Now it's time to help you return to your normal state of alertness. In a little while I shall begin counting backward from four to one. On the count of four, you can begin moving your legs and feet. On the count of three, you can begin to move your arms and hands, and on the count of two, you can move your head and neck. Then, on the count of one I'll ask you to open your eyes, feeling quite relaxed and calm, very pleasantly relaxed, just as if you had a brief nap. Ready now, four..... moving your legs and feet, feeling more alert, three..... moving your arms and hands, feeling refreshed and alert, two..... moving your head and neck, feeling more and more alert, one, now open your eyes, feeling pleasantly relaxed, calm, alert, and refreshed.

This is the end of tape one.

Tape 2

Progressive Relaxation Training:
Seven Muscle Groups

Get yourself in a comfortable, relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. We will begin this tape by giving you instructions on how you will tense and relax your muscles using only seven muscle groups. You may follow along with the instructions provided in your manual and practice the tensing instructions as they are given. During future practice sessions, once you are comfortable with how to tense these muscles, you can forward the tape to the beginning of the relaxation exercise which follows these instructions. Here are the instructions:

First, you will tense the muscles of your right hand, forearm, and upper arm all at once by pushing your right elbow down and back against the chair and making a tight fist. Now you try. Tense your right hand, forearm, and upper arm by pushing your right elbow down and back against the chair and making a tight fist now.. feel the muscles pull and become tense..... and relax (3 sec).

Next, you will tense the muscles of your left hand, forearm, and upper arm all at once by pushing your left elbow down and back against the chair and making a tight fist. Now you try. Tense your left hand, forearm, and upper arm by pushing your left elbow down and back against the chair and making a tight fist now.. feel the muscles pull and become tense..... and relax (3 sec).

You will tense the muscles in your forehead, upper cheeks, lower face, and jaw all at once by lifting your eyebrows as high as possible, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth backward in an exaggerated grin. Now you try. Tense your forehead, upper cheeks, lower face, and jaw by lifting your eyebrows, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth back now.. feel the muscles pull and become tight..... and relax (3 sec).

You will tense the muscles in your neck by pulling your chin toward your chest while keeping it from touching your chest. Now you try. Tense the muscles of your neck by pulling your chin toward your chest while keeping it from touching your chest now.. feel the muscles pull..... and relax (3 sec).

Next, you will tense the muscles in your chest, shoulders, upper back, and stomach all at once by taking in a deep breath and holding it,

pulling your shoulder blades back and together, and by making your stomach hard. Now you try. Tense the muscles of your chest, shoulders, upper back, and stomach by taking in a deep breath and holding it, pulling your shoulder blades back and together, and by making your stomach hard now.. feel the muscles pull and become tight..... and relax (3 sec).

You will tense the muscles in your right upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward. Now you try. Tense the muscles of your right upper leg, calf, and foot by lifting your right leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward now.. feel the muscles pull, become tense..... and relax (3 sec).

You will tense the muscles in your left upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward. Now you try. Tense the muscles of your left upper leg, calf, and foot by lifting your left leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward now.. feel the muscles pull, become tense..... and relax (3 sec).

This is the end of the instructions you will need to do the exercise which follows. Each instruction will be repeated during the relevant section of the tape.

Now, get yourself in a comfortable, relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. Close your eyes... and let yourself begin to relax (12 sec).

Ok. I'd like you to focus all of your attention on the muscles of your right hand, lower arm, and upper arm. All right, by pushing your right elbow down and back against the chair and making a tight fist, I'd like you to tense the muscles of your right hand, lower arm, and upper arm now. Feel the muscles pull, notice what it's like to feel tension in these muscles as they pull and remain hard and tight... And relax, just letting these muscles go ... noticing how they feel now as compared to before.. Focusing on these muscles as they relax more.. and more deeplythinking about nothing but the pleasant feelings of relaxation.....(12 sec).

By pushing your left elbow down and back against the chair and making a tight fist, I'd like you to tense the muscles in your left hand,

lower arm, and upper arm, now. Notice what it's like to feel the tension in these muscles as they pull and remain hard and tight.... And relax, letting all the tension go..... noticing the difference between tension and relaxation....focusing on these muscles as they relax more.. and more deeply..... focusing all your attention on the feelings of relaxation flowing into these muscles.....(12 sec).

By lifting your eyebrows as high as possible, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth backward in an exaggerated grin, I'd like you to tense the muscles in your forehead, upper cheeks, lower face, and jaw, now. Feel how tight and hard the muscles in your forehead, upper cheeks, lower face, and jaw feel.... And relax...let the tension go....just enjoying the sensations of pleasant, comfortable relaxationnoticing how these muscles feel as they smooth out.. unwind.. and relax more and more deeply....feeling warm, peaceful, calm and relaxed.....(12 sec). By pulling your chin toward your chest while keeping it from touching your chest, I'd like you to tense the muscles in your neck, now. Feel the muscles pull and become hard and tense... And relax..let all the tension go..... just enjoying the sensations of deep, complete relaxation flowing into these muscles..... more and more deeply and completely relaxed..... Notice how the muscles feel when so completely relaxed... feeling calm, peaceful, and relaxed....(12 sec).

By taking in a deep breath and holding it, pulling your shoulder blades together, and making your stomach hard, I'd like you to tense the muscles in your chest, shoulders, upper back, and stomach, now. Feel the tension building as the muscles are tense and tight.... And relax...letting all the tension go..... focusing on these muscles as they loosen up, smooth out, unwind, and relax.... noticing what it feels like as the muscles become more.. and more relaxed.... just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply.... more and more completely....(12 sec).

All right, by lifting your right leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward, I'd like you to tense the muscles in your right upper leg, calf, and foot, now. Feel these muscles become hard and tense, focus on the tension in these muscles.... And relax, just letting the muscles go..... noticing the difference between tension and relaxation..... focusing on the pleasant feelings in the muscles as they become more ... and more relaxed....Feeling warm.. heavy.. loose.. and relaxed.....(12 sec).

By lifting your left leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward, I'd like you to tense the muscles of your left upper leg, calf, and foot, now. Feel the muscles pull as they remain hard and tight, focus on that tension..... And relax, letting all the tension go..... focusing your attention on the feelings associated with warm relaxation flowing into these muscles....Just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply..... more and more completely.....(12 sec).

Now, we've relaxed the muscles in the arms and hands...just allow them to continue relaxing (5 sec)....We've relaxed the muscles in the face and neck.....go on allowing them to remain deeply relaxed (5 sec)... We've relaxed the muscles in the chest, the shoulders, the upper back, the stomach.....allow these muscles now to become even more deeply relaxed (5 sec)... We've relaxed the muscles of the legs and feet.... just allow these muscles to remain deeply and completely relaxed (5 sec).... If you notice any tension in any of your muscles, just focus on releasing the tension in these muscles.....Focus all your attention on the pleasant feelings associated with relaxation (10 sec). Feeling calm, peaceful, and relaxed. Noticing what it feels like as the muscles become more and more relaxed..... enjoying the feelings of deep relaxation.. as the muscles go on relaxing more and more completely (10 sec). There is nothing for you to do but to focus your attention on the very pleasant feelings of deep relaxation flowing throughout your body....Feeling warm, calm, peaceful, and relaxed (15 sec).

Now it's time to help you return to your normal state of alertness. In a little while I shall begin counting backward from four to one. On the count of four, you can begin moving your legs and feet. On the count of three, you can begin to move your arms and hands, and on the count of two, you can move your head and neck. Then, on the count of one I'll ask you to open your eyes, feeling quite relaxed and calm, very pleasantly relaxed, just as if you had a brief nap. Ready now, four..... moving your legs and feet, feeling more alert, three..... moving your arms and hands, feeling refreshed and alert, two..... moving your head and neck, feeling more and more alert, one, now open your eyes, feeling pleasantly relaxed, calm, alert, and refreshed.

This is the end of tape two.

Tape 3

Progressive Relaxation Training:
Five Muscle Groups

Get yourself in a comfortable, relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. We will begin this tape by giving you instructions on how you will tense and relax your muscles using only five muscle groups. You may follow along with the instructions provided in your manual and practice the tensing instructions as they are given. During future practice sessions, once you are comfortable with how to tense these muscles, you can forward the tape to the beginning of the relaxation exercise which follows these instructions. Here are the instructions:

First, you will tense the muscles of your right and left hands, forearms, and upper arms all at once by pushing your right and left elbows down and back against the chair and making a tight fist with each hand. Now you try. Tense your right and left hands, forearms, and upper arms by pushing your right and left elbows down and back against the chair and making a tight fist with each hand now. feel the muscles pull and become tense..... and relax (3 sec).

You will tense the muscles in your forehead, upper cheeks, lower face, jaw, and neck all at once by lifting your eyebrows as high as possible, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth backward in an exaggerated grin, while at the same time pulling your chin toward your chest while keeping it from touching your chest. Now you try. Tense your forehead, upper cheeks, lower face, jaw, and neck by lifting your eyebrows, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth back, while pulling your chin toward your chest now. feel the muscles pull and become tight..... and relax (3 sec).

Next, you will tense the muscles in your chest, shoulders, upper back, and stomach all at once by taking in a deep breath and holding it, pulling your shoulder blades back and together, and by making your stomach hard. Now you try. Tense the muscles of your chest, shoulders, upper back, and stomach by taking in a deep breath and holding it, pulling your shoulder blades back and together, and by making your stomach hard now. feel the muscles pull and become tight..... and relax (3 sec).

You will tense the muscles in your right upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot

inward. Now you try. Tense the muscles of your right upper leg, calf, and foot by lifting your right leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward now. feel the muscles pull, become tense..... and relax (3 sec).

You will tense the muscles in your left upper leg, calf, and foot all at once by lifting your leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward. Now you try. Tense the muscles of your left upper leg, calf, and foot by lifting your left leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward now. feel the muscles pull, become tense..... and relax (3 sec).

This is the end of the instructions you will need to do the exercise which follows. Each instruction will be repeated during the relevant section of the tape.

Now, get yourself in a comfortable, relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. Close your eyes... and let yourself begin to relax (12 sec).

Ok. I'd like you to focus all of your attention on the muscles of your right and left hands, lower arms, and upper arms. All right, by pushing your right and left elbows down and back against the chair and making a tight fist with each hand, I'd like you to tense the muscles of your right and left hands, lower arms, and upper arms now. Feel the muscles pull, notice what it's like to feel tension in these muscles as they pull and remain hard and tight... And relax, just letting these muscles go ... noticing how they feel now as compared to before.. Focusing on these muscles as they relax more.. and more deeply relaxed.....thinking about nothing but the pleasant feelings of relaxation.....(12 sec).

By lifting your eyebrows as high as possible, squinting your eyes, wrinkling up your nose, clenching your teeth, and pulling the corners of your mouth backward in an exaggerated grin, while at the same time pulling your chin toward your chest while keeping it from touching your chest, I'd like you to tense the muscles in your forehead, upper cheeks, lower face, jaw, and neck now. Feel the muscles pull, feel how tight and hard the muscles feel.... And relax...let the tension go....just enjoying the sensations of pleasant, comfortable relaxationnoticing how these muscles feel as they smooth out.. and relax more and more

deeply....feeling warm, peaceful, calm and relaxed.....(12 sec).

By taking in a deep breath and holding it, pulling your shoulder blades together, and making your stomach hard, I'd like you to tense the muscles in your chest, shoulders, upper back, and stomach, now. Feel the tension building as the muscles are tense and tight.... And relax...letting all the tension go..... focusing on these muscles as they loosen up, smooth out, unwind, and relax.... noticing what it feels like as the muscles become more.. and more relaxed.... just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply.... more and more completely..... (12sec)

All right, by lifting your right leg slightly off the chair, straightening your leg, and pointing your toes and turning your foot inward, I'd like you to tense the muscles in your right upper leg, calf, and foot, now. Feel these muscles become hard and tense, focus on the tension in these muscles.... And relax, just letting the muscles go..... noticing the difference between tension and relaxation..... focusing on the pleasant feelings in the muscles as they become more ... and more relaxed.....Feeling warm.. heavy.. loose.. and relaxed.....(12 sec).

By lifting your left leg off the chair slightly, straightening your leg, and pointing your toes and turning your foot inward, I'd like you to tense the muscles of your left upper leg, calf, and foot, now. Feel the muscles pull as they remain hard and tight, focus on that tension..... And relax, letting all the tension go..... focusing your attention on the feelings associated with warm relaxation flowing into these muscles....Just enjoying the pleasant feelings of relaxation, as the muscles go on relaxing more and more deeply..... more and more completely.....(12 sec).

Now, we've relaxed the muscles in the arms and hands... just allow them to continue relaxing (5 sec)....We've relaxed the muscles in the face and neck.....go on allowing them to remain deeply relaxed (5 sec)... We've relaxed the muscles in the chest, the shoulders, the upper back, the stomach.....allow these muscles now to become even more deeply relaxed (5 sec)... We've relaxed the muscles of the legs and feet... just allow these muscles to remain deeply and completely relaxed (5 sec).... If you notice any tension in any of your muscles, just focus on releasing the tension in these muscles.....Focus all your attention on the pleasant feelings associated with relaxation (10 sec). Feeling calm, peaceful, and relaxed. Noticing what it feels like as the muscles become more and more relaxed.... enjoying the feelings of deep relaxation.. as the muscles go on relaxing more and more completely (10 sec). There is nothing for you to do but to focus your attention on the very pleasant feelings of deep relaxation flowing

throughout your body....Feeling warm, calm, peaceful, and relaxed (15 sec).

Now it's time to help you return to your normal state of alertness. In a little while I shall begin counting backward from four to one. On the count of four, you can begin moving your legs and feet. On the count of three, you can begin to move your arms and hands, and on the count of two, you can move your head and neck. Then, on the count of one I'll ask you to open your eyes, feeling quite relaxed and calm, very pleasantly relaxed, just as if you had a brief nap. Ready now, four..... moving your legs and feet, feeling more alert, three..... moving your arms and hands, feeling refreshed and alert, two..... moving your head and neck, feeling more and more alert, one, now open your eyes, feeling pleasantly relaxed, calm, alert, and refreshed.

This is the end of tape three.

Tape 4

Relaxation by Recall

Get yourself in a comfortable, relaxed position, sitting in a comfortable chair with your arms and head supported. Be sure to loosen any tight clothing. The goal of this relaxation technique is to help you learn to become relaxed without actually tensing your muscles. This is called Relaxation by Recall. During the relaxation by recall practice, you will focus on five muscle groups one at a time. We will begin with your arms. Second we will move to your face and neck, third to your chest, shoulders, upper back and stomach, fourth to your right leg, and finally to your left leg. Now close your eyes, take a deep breath and let yourself begin to relax (10 sec).

Now what I'd like you to do is focus your attention on both of your arms. Concentrate on your hands, your forearms, and your upper arms. Try to pinpoint any feelings of tension or tightness in your arms. Now relax your arms by releasing all your muscles. Try to recall what it feels like when your hands and arms are very relaxed. Let all of your tension go..... Focus on your arm muscles as they just relax completely. Just let yourself become more and more relaxed..... As you think of relaxation, and of letting go of your muscles, they will become more loose, heavy and relaxed... Just let your muscles go as you become more and more relaxed (12 sec).

Now I want you to focus your attention on the muscles in your face and neck. Identify any tension that may be present around your forehead, your eyebrows, your mouth, and your neck. If you identify any tension, just let go of those muscles, and let yourself become more and more relaxed. Recall what it feels like to be relaxed in your face and neck..... Notice what it feels like as the muscles become more and more relaxed..... Enjoy the pleasant feelings of relaxation as your muscles go on relaxing more and more deeply, more and more completely (12 sec).

Next, focus on the muscles in your chest, your shoulders, your upper back, and your stomach. Take a deep breath and let it out slowly. Notice any tension in your chest and stomach, and remember what it feels like when those muscles are relaxed. Identify any tension in your shoulders and upper back and recall what it feels like when you are relaxed..... Focus on these muscles as they loosen up, smooth out, unwind, and relax.... Your breathing is regular and relaxed. With each breath you take, your relaxation increases..... Each time you exhale, you spread the relaxation throughout your body. Becoming more and more relaxed (12 sec).

Focus now on the muscles of your legs. Identify any tension in the right upper leg, the right calf, the right foot. Then release the tension and let the muscles become more relaxed (5 sec). Now identify any tension in the left upper leg, the left calf, the left foot. Relax, let all of the tension go, recalling the sensations of deep relaxation.... Focus on the pleasant feelings of relaxation as the muscles relax and become more comfortable (12 sec).

Allow all of the muscles of your body to continue relaxing (5 sec).... Scan your body and try to pinpoint any tension that might remain. Check your hands and arms.....just allow them to continue relaxing. Your face and neck.....your chest and shoulders.....allow these muscles to become even more deeply relaxed.... Your upper back and stomach.....your legs and feet.... If you notice the slightest tension, just let go of your muscles and let yourself become more and more relaxed.....let yourself go into a restful state of deep relaxation (5 sec). Feeling warm, calm, peaceful, and relaxed (15 sec).

Just remain in your very relaxed state. Begin to focus on the slow rhythm of your breathing.... Let the air fill your lungs, then gently exhale. Allow your stomach to rise and fall as you continue your slow, deep breathing.... Each time you breathe in, say to yourself "I am," and as you breathe out, silently repeat the word "relaxed." I am..relaxed....I am..relaxed....I am..relaxed....allow yourself to go on relaxing (15 sec).

When you are ready to return to your normal, alert state, count backward to yourself from four to one, and as you count, you can begin to move your arms and hands, your neck and shoulders, your legs. Then you can open your eyes feeling pleasantly relaxed, alert, and refreshed.

This is the end of tape four.

